Issued November 28, 1911.

U. S. DEPARTMENT OF AGRICULTURE,
FOREST SERVICE—BULLETIN 100.
HENRY S. GRAVES, Forester.

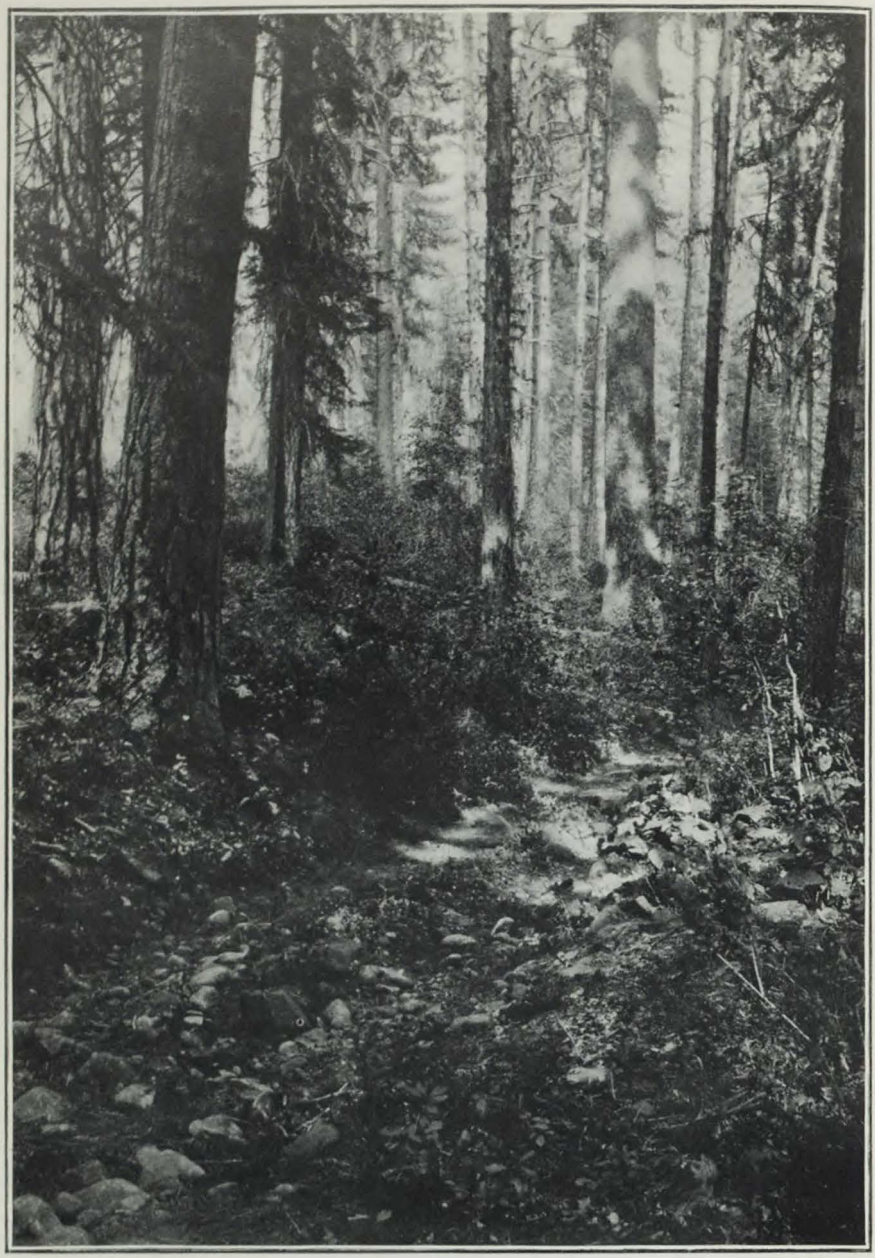
THE CRATER NATIONAL FOREST:

ITS RESOURCES AND THEIR CONSERVATION.

BY

FINDLEY BURNS,
CHIEF OF PUBLICATION, FOREST SERVICE.

WASHINGTON
GOVERNMENT PRINTING OFFICE
1911



COMPARATIVELY OPEN STAND OF TIMBER ON THE EAST SLOPE OF THE CASCADES, CRATER NATIONAL FOREST, SHOWING LARGE YELLOW PINES.

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LETTER OF TRANSMITTAL.

U. S. Department of Agriculture,
Forest Service,
Washington, D. C., June 22, 1911.

Sir: I have the honor to transmit herewith a manuscript entitled "The Crater National Forest: Its Resources and Their Conservation," by Findley Burns, Chief of Publication, and to recommend its publication as Bulletin 100 of the Forest Service.

Respectfully,

Henry S. Graves,
Forester.

Hon. James Wilson,
Secretary of Agriculture.

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THE CRATER NATIONAL FOREST.[1]

Area, 1,166,600 acres. Headquarters, Medford, Oreg.

THE FOREST.

The Crater National Forest, situated in a heavily forested region in southwestern Oregon, with a small area in northern California, contains approximately 10,197,000,000 board feet of merchantable timber, and is capable of producing a sustained annual yield of 90,000,000 board feet. A portion of the timber is tributary to the Sacramento Valley and to San Francisco for rail and water shipment, while other portions, at present inaccessible, will, with the completion of railroads now building or planned, become available to supply a number of outside markets. Because of the large private holdings of timber in the vicinity of the Forest, the west and most heavily timbered slope has not yet been called upon to supply the local demand for any material other than cordwood. The entire timber resources of the Forest will in the future be available when the timber on private lands has been cut away.

The streams which head within the Forest water the rich Rogue River Valley, one of the greatest apple and pear producing regions in the United States, furnish the cities of Ashland and Medford and the town of Butte Falls with their supply of water for domestic use, and will in the future be the chief source of supply for Government reclamation projects involving 240,000 acres of land. While some of the streams are already utilized for the development of power, there yet remains within the Forest about 300,000 horsepower undeveloped.

On the mountain meadows and in open timber the Forest offers range for about 4,000 cattle and 9,500 sheep. All of the range is fully utilized.

Northeast of the Forest lies the Crater Lake National Park, containing Crater Lake, one of the natural wonders of America, and visited each year by a great number of tourists.

The force at present on the Forest consists of a supervisor, a deputy supervisor, 2 technical assistants, 10 rangers, and 8 guards.

[1] For much of the material contained in this bulletin the author is indebted to Mr. S. S. Swenning, deputy supervisor, and to the silvical reports of Mr. H. D. Foster, forest assistant, Crater National Forest. He is also greatly indebted to Mr. M. L. Erickson, forest supervisor, Crater National Forest, and to Messrs. C. J. Buck and F. E. Ames, assistant district foresters, District 6, for aid in securing both figures and facts.

TOPOGRAPHY AND DRAINAGE.

The Forest is made up of two separate areas, one of which comprises the Siskiyou Mountains, culminating in Ashland Butte, with an altitude of 7,662 feet, while the other includes the southern slope of the Umpqua Range and the southern end of the Cascade Mountains. (See map.) The Siskiyou portion, much the smaller and least important of the two, is rugged and without plateaus, and is characterized by deep canyons and high, rocky ridges. In many places it is as yet untraversable. Descending the mountains, the slopes become less rugged, until finally the rough mountain sides clothed with mature timber give place to rolling, barren hillsides covered with dense brush. At all elevations are openings such as glades, cliff outcrops, and mountain meadows.

The mountains of the Cascade portion, on the other hand, extend very uniformly in a north and south direction. Their western slope is rather abrupt, rising from the valley of the Rogue River, which has an elevation of about 1,300 feet, to a broad, heavily timbered plateau, broken by gullies, buttes, and peaks. The highest peak, Mount McLaughlin, is 9,760 feet high. The areas which go to make up the main Cascade Plateau are the Upper Rogue River Basin, with an elevation of 3,500 feet and an area of 17,000 acres; the Dead Indian Plateau, with an elevation of 4,000 feet and an area of 30,000 acres; the Buck Lake Basin, 5,000 feet high and 10,000 acres in extent; and the plateaus of Lake o' the Woods and Four Mile Lake, the former 5,000 feet high and with an area of 10,000 acres, and the latter 6,000 feet high and with an area of 3,000 acres. In addition, but forming no part of the Cascade Plateau, there is a long, narrow strip of comparatively level land, heavily timbered, adjacent to Upper Klamath Lake, with an average width of 2 miles and a total area of about 40,000 acres.

On the Cascade Plateau lie several lakes, such as Lake o' the Woods, Fish Lake, and Four Mile Lake. There is no marked ridge dividing the east and west drainage systems. An irrigation company is now constructing a ditch to deflect the water of Four Mile Lake, which naturally flows eastward to Klamath Lake, into Fish Lake, and from there westward to the Rogue River Valley.

The east slope of the Cascade Range within the Forest drops down to the broad plateau, of about 4,000 feet elevation, of south-central Oregon.

Practically the whole Forest is timbered. The only treeless portions are a few alpine areas on the crests of the higher mountains, some lava beds, mountain meadows scattered here and there, and brush land, the result of fire. Of the entire Forest 70 per cent is covered with merchantable timber, 20 per cent bears stands of unmerchantable timber, largely young growth, and 10 per cent is grass or brush land and barren areas.

The Siskiyou portion of the Forest is drained by Ashland Creek and Applegate Creek and its tributaries. The greater portion of the Cascade division is drained by the Rogue River and its tributaries, Evans Creek, Elk Creek, and Big and Little Butte Creeks. (See map.) These rapidly falling streams cut the west slope of the Cascades into canyons. The east slope has comparatively little surface drainage; what streams there are flow into Klamath Lake and Klamath River. Taking the Forest as a whole, four-fifths of its entire drainage goes to the Rogue River Valley.

WATER FOR FRUIT AND FARM LANDS.

In general, the precipitation on the Forest is greater on the west than on the east side of the Cascades. The amount, however, is determined largely by the relief of the country. In the low-lying valleys on the west slope, for instance, the climate is semiarid, while on the east slope at high altitudes it is humid. The annual precipitation on the higher mountains and on the Cascade Plateau probably exceeds 70 inches. At the lower elevations on slopes and in valleys the annual precipitation is seldom greater than 30 inches, and is often 25 inches or less. During the three summer months there is practically no rainfall.

On the east slope much of the precipitation is in the form of snow, since here it is much colder than on the west slope, and the only rain that falls during the summer comes in short showers. Heavy rain falls, however, in the spring and autumn. Snow falls to a depth of from 6 to 10 feet at Lake o' the Woods and Four Mile Lake, which are on the plateau, and in the vicinity of Island Lake, which lies north of Four Mile Lake; and near the summit of the Cascades the snow is from 10 to 14 feet deep throughout the winter.

Over most of the Forest the rainy and dry seasons are marked. The first extends from October to April or May, and occasionally to the 1st of July. Probably 75 per cent of the yearly precipitation falls between November 1 and May 1. In some years but few rains come after April 1, and the effects of these are quickly counteracted by long, dry, sunny periods. The snow leaves the mountains by April, sometimes before. Such a climate makes protection from fire difficult but imperative, if the water supply is to be conserved. The low, dry foothills and valleys near the Forest are fertile, and wait only for water to produce the best of farm crops.

Four-fifths of the water which flows from the Forest is available for irrigation of the Rogue River Valley, lying west of the Cascades and north of the Siskiyous, one of the most productive apple and pear centers in the United States. The climate of the valley is uniform, and favorable for all kinds of vegetables as well as for fruit. The most central and largest market is Medford, which, with other

neighboring towns, consumes most of the farm products. The fruit, however, is shipped in large quantities to eastern markets. The main supply of water for the valley is taken from Rogue River and its tributaries, and with the present forested condition of their watersheds the flow is sufficient for all the valley's needs. Even Bear Creek, which flows directly through the valley, and is most heavily used, never goes entirely dry. More and more, however, the fruit and agricultural regions west of the Forest are coming to rely upon irrigation for larger crops, and their supply of water will have to be obtained altogether from the Forest streams and reservoirs. Applegate River, besides supplying water for a portion of the Rogue River Valley, also irrigates the bottom lands along its course. The soil of these is deep, and alfalfa is raised to the practical exclusion of fruit.

On the west slope of the Cascades the Fish Lake Water Co. has secured permits from the Government for reservoirs at both Four Mile and Fish Lakes, and its laterals and ditches cover a large portion of the Rogue River Valley. The Fish Lake Reservoir of this company is also the source of water supply for Medford, a city of about 9,000 inhabitants. The city of Ashland, lying south of Medford, and with approximately the same population, has a municipal power plant and water system maintained entirely by the flow from that portion of the Forest.

The Rogue River Valley Canal Co. is constructing a ditch connecting Four Mile Lake with Fish Lake, and already has a canal which runs from the latter point westward for 30 miles. The water it carries is used to irrigate the land for several miles on either side.

The region to the east of the Forest forms part of the dry plateau of central Oregon, and is almost exclusively a stock region. Hay is practically the only commercial crop raised at present. The United States Reclamation Service is engaged on important projects on the eastern slope of the Klamath watershed, by which some 240,000 acres of land will be supplied with water. These projects depend largely upon watersheds within the Forest.

WATER POWER.

Practically the entire lengths of Rogue River and its tributaries offer sites for power development. On the Rogue River the chief power sites are at Rogue River Canyon, Rogue River Falls, Mill Creek Falls, Red Blanket Falls, and at the Gorge and Natural Bridge, all in the vicinity of Prospect, Oreg. The Siskiyou Electric Power and Light Co., successor to the Rogue River Electric Co., already has a large plant on Rogue River at Gold Ray, and is constructing another on the upper Rogue, near Prospect. This company, which furnishes most of the Rogue River Valley with light and power, plans to establish an electric tramway from the valley to

Prospect, a distance of 50 miles, for which the Rogue River will furnish power. Power sites are also found on Butte Creek, on the Middle Fork of Rogue River, and on Whiskey Creek.

TIMBER.

SPECIES AND AMOUNT.

According to the best available estimates, the 10,197,000,000 feet of timber on the Forest is made up of yellow pine, 1,767,000,000 board feet; Douglas fir, 3,234,000,000 board feet; sugar pine, 195,000 board feet; white fir, 2,204,000,000 board feet; and other species, 2,797,000,000 board feet. Of the trees included under "other species," noble fir, lodgepole pine, Engelmann spruce, incense cedar, and western white pine are the most important.

The topography of the Forest divides it naturally into four parts—the east slope, the Cascade Plateau, the west slope, and the Siskiyou Mountains. The stand on each of these is given in the following table:

Stand of timber on the Crater National Forest, by divisions.

	East slope.	Per cent.	Cascade Plateau.	Per cent.	West slope.	Per cent.	Siskiyou Mountains.	Per cent.	Total.	Per cent.
	Million board feet.		*Million board feet.*		*Million board feet.*		*Million board feet.*		*Million board feet.*	
Yellow pine	463	28	184	7	1,040	24	80	5	1,767	17
Douglas fir	319	19	690	27	1,600	36	625	41	3,234	31
Sugar pine	58	4	15	.....	114	2	8	.....	195	2
White fir	267	17	640	25	824	18	473	31	2,204	21
Other species	529	32	1,075	41	840	20	353	23	2,797	29
Total	1,636	100	2,604	100	4,418	100	1,539	100	10,197	100

FOREST TYPES.

The traveler through the timber on the Crater Forest will meet four broad forest types: (1) Yellow pine, (2) lodgepole pine, (3) Douglas fir, and (4) subalpine.

On the east slope of the Cascades, below 5,000 feet, should he enter the Forest from that side, he will encounter the yellow-pine type. Yellow pine is the most valuable timber tree of any found in quantity on the Forest. Though it grows in the Siskiyous from 1,500 to 3,500 feet, and on the west slope of the Cascades up to 4,300 feet, it is only on the east slope that it is well marked as a type. Here the traveler will pass through a forest which, while rarely if ever pure yellow pine, often is nearly so, especially on the slopes, benches, and flats. Douglas fir, sugar pine, white fir, incense cedar, and lodgepole pine, however, are usually present in mixture, though one or more may be absent. The stand on the type is comparatively open, and the forest floor is dry, though in places a heavy cover of snowbrush and in others manzanita and low brushes, tend to retard

evaporation. The yellow pine is best developed where it is most nearly pure; that is, on the lower slopes and benches. On the west slope and in the Siskiyous the best yellow pine is found in low valleys, on benches, and along eastern and southern slopes.

Sugar pine is an integral part of the yellow-pine type, and, in fact, grows everywhere throughout the Forest where yellow pine is found. It is most common on ridges and on northern slopes and benches. It is a more valuable timber tree than yellow pine, but it grows scatteringly and the amount of it is relatively small.

If the traveler should emerge from the yellow-pine type near the edge of a marsh, or on a dry flat at a higher altitude where fire has destroyed some other stand, he would most likely find himself in the lodgepole-pine type. This might even be considered as a subtype of the yellow pine. Lodgepole, however, is found on a variety of sites. It grows on the dry soils near Anna Creek, where nothing else but yellow pine seems able to maintain a foothold, on slopes, on the higher interior plateau, and on benches. It is also found along streams and on the edges of lakes and marshes, where the soil is too damp to permit other species to enter into competition with it. The stand on the type is one of pure lodgepole, usually a close thicket of slender poles. The forest floor is either comparatively bare or covered with a scanty mat of twigs and leaves. At first sight the type seems in many places to be encroaching upon the yellow pine, but though it has come in on the yellow-pine type after fire, the latter, if fire is kept out in the future, will gradually regain the ground.

Climbing higher, the traveler leaves the yellow pine and lodgepole and enters the subalpine type. This he will find in general covering the higher peaks and mountain masses and over a large portion of his way across the Cascade Plateau. Of the species which compose it, noble fir, white fir, mountain hemlock, white-bark pine, and Engelmann spruce are characteristic. These are mixed in varying proportions according to altitude, exposure, and soil. In exposed, thin-soiled situations white-bark pine constitutes a major portion of the stand, mixed with mountain hemlock and noble fir, and forming what might be considered a subtype. These areas, however, are comparatively small. Noble fir is found on the Umpqua-Rogue River Divide, in the vicinity of Crater Lake, on the summit of the Cascades between altitudes of 6,000 and 7,000 feet, and in the higher Siskiyous. White fir grows over a large portion of the forest, but is chiefly characteristic of the subalpine type. It is very susceptible to rot, and is easily thrown by the wind. It can be used for box boards and rough lumber, and as it becomes better known more important uses may be found for it. Because of its adaptability to a variety of soils it is likely to supplant more valuable species in the stand. Mountain hemlock is met with throughout the types in the Cascades, and on

Ashland Butte and other high points in the Siskiyous. Engelmann spruce is found chiefly in draws and upper canyon bottoms and along marshes, streams, and lakes at high altitudes. Western white pine grows in mixture with the firs on the upper eastern and western slopes of the Cascades, on the plateau, and in the higher Siskiyous. Over most of the type the traveler will pass beneath a dense leaf canopy, among large, clear-boled trees, with an understory of chinquapin, yew, vine maple, and other shrubby trees and a mat of ferns and other plants. Humus is deep and the soil fresh to moist. Where fire has destroyed the humus and killed enough trees to expose the ground to the drying action of the sun, lodgepole pine replaces the former stand, as on the yellow-pine type.

Once across the plateau, and beginning the descent of the other side of the range, the traveler enters the Douglas fir type. This covers a large part of the west slope of the Cascades and a considerable area in the Siskiyou Mountains at altitudes between 3,800 and 6,200 feet. While not entirely absent on the east slope, it is there confined to the immediate slopes of the main range and to those of the secondary range between Upper Klamath Lake and the Cascades at altitudes between 5,500 and 6,500 feet. In general, it occupies higher elevations and situations with greater precipitation and moister soil than the yellow-pine type. Its lower limits often meet the upper ones of yellow pine, while its upper range encroaches upon the subalpine type. While Douglas fir is not as valuable as either western yellow or sugar pine, its abundance on the Forest makes it almost as important as the first of the two other species. On the Pacific slope as a whole Douglas fir is the most important timber tree, and on the Crater Forest it attains excellent development. The stand on the type is never pure Douglas fir, but contains varying amounts of yellow, white, sugar, and lodgepole pine, white and noble fir, western hemlock, and Engelmann spruce. In many places Douglas fir far outnumbers the other species, while in others white fir leads. Toward its lower limits on the west slope and in the Siskiyous the type passes gradually into a stand of mixed conifers in which no one species is predominant, but in which yellow and sugar pine attain a better development than Douglas fir. In general on the type, Douglas fir predominates between altitudes of 5,300 and 5,900 feet, while below are greater quantities of the species forming the yellow-pine type, and above of those forming the subalpine type.

It is in the Douglas fir type that the traveler will see the densest stand of timber on the Forest. In few places has it the open aspect of the yellow-pine type. Except where the heaviest stands of mature timber shade the ground, there is a good undergrowth of many species of shrubs. Humus is fairly abundant, and, where fire has not run over the ground for a hundred years or more, it is from 3 to 5 inches deep.

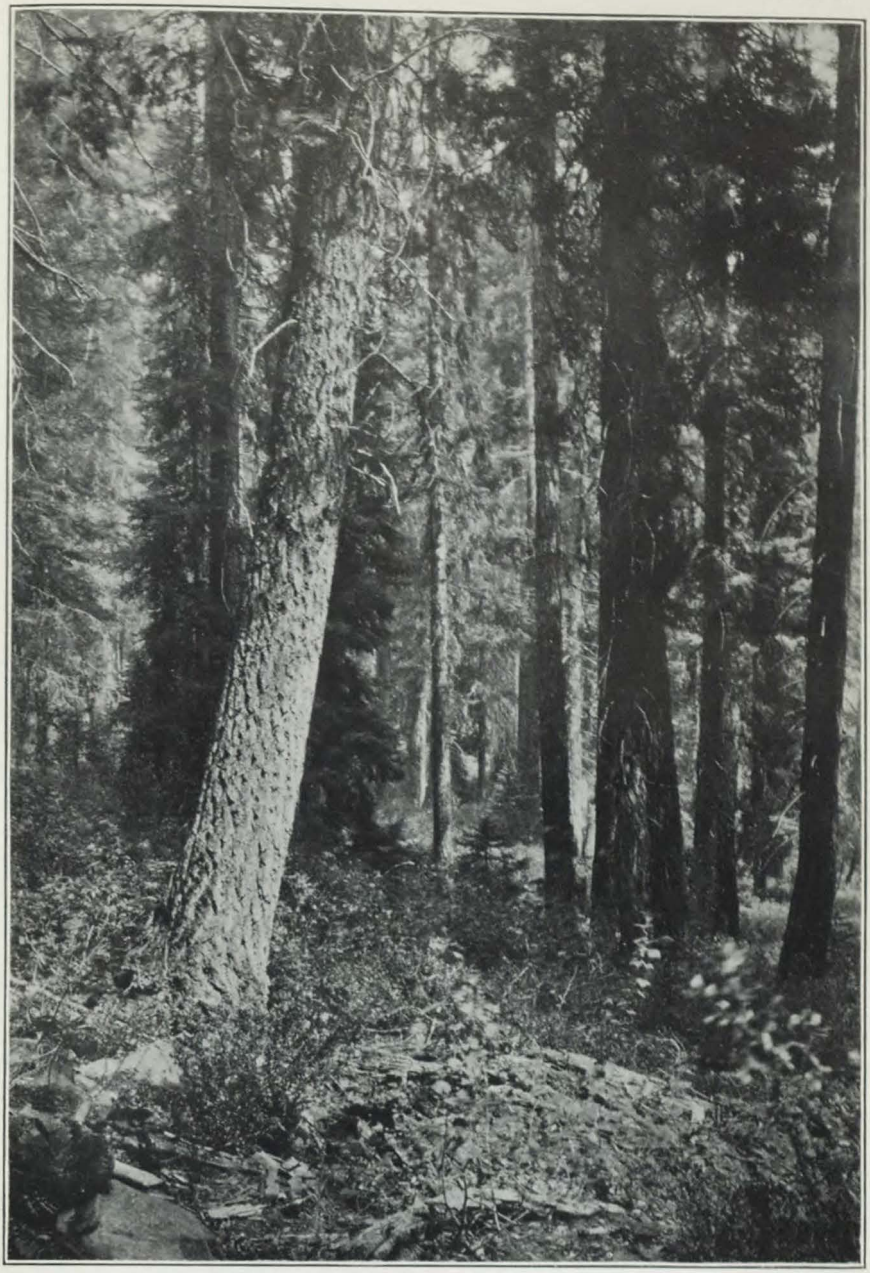
Besides the species mentioned under the different types, the traveler will meet other species here and there on the Forest. Incense cedar grows over much of it, closely coinciding with sugar pine in range and site, though it will grow on somewhat drier soil. It never grows pure, but holds a subordinate position in mixed stands of other species. It is valuable for posts, especially when fire killed, since in that condition it is more durable than when green. Western hemlock is found along the canyons of the Rogue River and its tributaries, on the Umpqua-Rogue River Divide, and south of Lake o' the Woods; western yew in the dense, moist forests at high altitudes, where it is usually low and shrubby, but highly prized for posts; willow, aspen, cottonwood, and alder along streams, lakes, and marshes at medium altitudes, the three last finding use as firewood; and here and there throughout the Forest single individuals and small bodies of alpine, amabilis, and red fir.

INSECTS AND DISEASES.

Over the whole Forest about 60 per cent of the timber is mature, while much is fire scarred and dying. Barkbeetles are at work in the yellow pine throughout the Forest, and during the past 25 years have done much damage to the standing timber of that species. On the area now included within the Forest boundaries the insects have, during that time, killed approximately 48,880,000 feet b. m. of timber, divided as follows: On the east slope, 17,120,000 feet; on the plateau, 3,680,000 feet; on the west slope, 25,680,000 feet; and in the Siskiyous, 2,400,000 feet. Many of the older Douglas firs are affected by a dry rot, which appears as white flakes or short streaks throughout the grain. As a rule this starts from the roots or a wound at the base of the tree, and extends upward, so that while the first two or three logs may be affected, the remainder of the tree is sound. This rot is especially common in the Klamath Lake region. White fir is especially susceptible to decay, and many trees above 40 inches in diameter on the Forest are so rotten as to be valueless even for cordwood. In the cedar a fungus disease known as pencil rot is very common. Sugar pine on the Forest is peculiarly free from insects, though it is often injured by windshake.

MARKET.

The largest body of timber on the Forest at present accessible is that growing on the Klamath Lake watershed on the east slope of the Cascades. Here are arms of the lake in which logs can be rafted and taken to the railway at Klamath Falls, a branch line of the Southern Pacific, which furnishes an outlet for lumber not needed for local use. Logs for local consumption are rafted to other points on the lake.



WITHIN THE SUBALPINE TYPE ON THE CRATER NATIONAL FOREST.

While a large part of the region lying east of the Forest will probably remain a stock country, the completion of the reclamation project already mentioned will mean the rapid development of large areas in Klamath County. It is also probable that portions of the open country now given over to range cattle will in the future be used for dairying. Since there is a much smaller amount of timber in private hands on this side of the Cascades than on the west side, the rapidly developing portions of the regions will come to rely early upon the Forest for their supply. Already Fort Klamath is becoming thus dependent.

Much of the timber on the east slope of the Cascades and in the Siskiyous is at present largely inaccessible. The streams are not drivable without rather expensive improvement work, and to reach the only railroad, the Southern Pacific, means a haul of from 10 to 50 miles. Large private holdings, more accessible than the Forest timber, will soon be logged by the lumber companies in the valleys and supply practically all the present local demand. The new line of the Pacific & Eastern Railway from Medford to Butte Falls, already in operation, will, however, make accessible a considerable amount of Forest timber. It is planned further to extend the road up Willow Creek over the Fish Lake Divide to Pelican Bay, which will take it directly through the Forest and will make possible the logging of a large area. Butte Falls, which lies but a mile from the Forest boundary, is even now a lumber camp of some importance with a well-equipped sawmill.

From a silvicultural standpoint it would be desirable to get rid of the mature timber on the Crater Forest, an enormous amount in the aggregate, as fast as it could be cut. The present inaccessibility of most of it, however, would preclude the possibility of this, even were there not other factors to be taken into account. Of these factors, the large amount of privately owned timber in the region is one of the most important. The lumberman can not be expected to hold his timber for any great length of time. He must pay taxes on it, must get some return from his investment within a reasonable period, and the longer he holds the timber the greater is the chance that it will be destroyed by fire. He has timber enough to meet a large part of the present demand, and will do so. But because in most cases he must market his timber now, he will not be able to supply the future demand, which, in the Pacific Northwest at least, bids fair to be much greater than the present. If the development of the country is to go forward with the same strides as in the past, there must be a permanent source of supply available when the timber from private lands has been disposed of. National Forests such as the Crater were created for just this purpose. Even if it were possible to throw all of its merchantable timber on the market now, no good and much harm would result,

since the market would be overstocked without reason, the lumber trade demoralized, and the amount of standing timber available in the future, when the need for it will be real, greatly lessened.

It should not be implied from this that the timber on the Crater Forest will not be disposed of, even at present, where there is need for it. One large sale for 100,000,000 feet is now in progress in the yellow-pine type on the east side of the Forest, in the Klamath Lake country. An informal application for another sale of approximately 100,000,000 feet on the west side of the Cascades, contingent upon the extension of the Medford-Butte Falls Railroad, has been received, and the sale will probably be made when the road is opened.

MANAGEMENT.

In the management of the timber on the Forest, manifestly the first step will be to remove as much as possible of the dead, diseased, and overmature timber which forms such a considerable portion of the stand. All timber sales, for the present at least, will have this end in view.

To make certain that the future stand upon the Forest will be composed as far as possible of the more valuable species, the plan of management will vary with the type of timber cut. Yellow pine is the most valuable tree on the forest, and the aim will be to favor it wherever it is found in sufficient quantity to insure a second crop. In all cases where yellow pine is to be favored, the selection system of cutting will be used. Thus, in mixed stands of yellow pine, sugar pine, Douglas fir, and incense cedar, the mature and overmature trees will be removed, and enough yellow pine seed trees left to insure reproduction. The soil is stirred by logging and exposed by brush burning sufficiently to insure the germination of yellow pine seed, while at the same time offering unfavorable conditions for Douglas fir, the seeds of which will germinate best on bare mineral soil. Incense cedar will be cut to a lower diameter limit than the other species, which will mean the removal of practically all seed trees, and its consequent elimination from the second crop. Sugar pine, though as valuable a tree as yellow pine, grows very scatteringly on the Forest, and its total volume in comparison with that of the other chief species is exceedingly small. As many seed trees as possible will be left standing, however, since the selection system is as favorable to the reproduction of sugar as it is to that of yellow pine. The resultant stand on such areas should contain a very large proportion of yellow pine, a larger proportion of sugar pine than in the original stand, and a small quantity of Douglas fir.

While Douglas fir on the Crater Forest is not as valuable as sugar pine and yellow pine, it is more valuable than any other species found in quantity, and will be favored wherever it is impossible to insure the predominance of yellow pine in the second stand, as well as in

situations especially favorable for its growth. Thus, in mixed stands the Douglas fir, white fir, hemlock, and western red cedar, the stand will be cut clean, in strips or blocks, with here and there blocks of Douglas fir seed trees. The logged area will then be burned. In this way conditions for the reproduction of Douglas fir, which requires mineral soil for successful reproduction, will be especially favorable, while those for hemlock and white fir, which require shade for reproduction, will be decidedly unfavorable. The second stand, therefore, should be an almost pure one of Douglas fir, with a certain amount of western red cedar, and little or no hemlock and white fir.

The susceptibility of white fir to disease and the poor quality of its lumber, together with its tendency to take the place of more valuable species in the stand, necessitates the attempt to rid the Forest of it. In order that yellow pine and Douglas fir may take its place, it will be cut to as low a diameter limit as possible wherever found.

Certain areas on the Forest will support lodgepole pine, but nothing else of equal value. Since lodgepole germinates only on exposed soil, is easily wind-thrown, and needs heat to open its cones, clear cutting in strips or small blocks, with later burning of the logged area, will be the system used. By this method no isolated seed trees will be left to blow down, but seeding will come from the sides, while the bare soil after burning will offer favorable ground for the germination of the seed.

An example of some of these methods put into actual practice is given on the area covered by a timber sale to the Pelican Bay Lumber Co., on the east slope of the Cascades and typical of the yellow-pine country. The area, containing 7,120 acres, is situated on the watershed of Varney Creek, and the stand consists of 64,186,000 feet of yellow pine, 21,822,000 feet of Douglas fir, 10,884,000 feet of white fir, 2,277,000 feet of sugar pine, 659,000 feet of noble fir, 178,000 feet of white pine, 72,000 feet of lodgepole pine, 170,000 feet of Engelmann spruce, and 424,000 feet of incense cedar, live saw timber, and 2,840,000 feet of merchantable dead saw timber, making a total stand of 103,512,000 board feet. The prices per 1,000 feet b. m. are $3.25 for live yellow, sugar, and white pine, and $1.50 for all other species and all dead saw timber. Much of the timber is overmature, and some of it is infected with either insects or disease, making its removal from the Forest desirable.

The stand on the tract is chiefly yellow pine, varying greatly in age, quality, and density. Fifty per cent has passed, and 25 per cent has reached, maturity. Ten per cent of the mature trees are affected by insects to a slight extent, 2 per cent seriously, and 5 per cent have been killed.

Douglas fir is dominant on a considerable area along creeks and on moister situations, and is in mixture over the entire tract. The trees for the most part are small and limby, and suitable only for common

lumber. There is little insect damage, though witches' broom affects about 15 per cent of the trees. As yet, however, damage from this source is slight.

The white fir is above the average in quality, since only about 20 per cent of the stand is defective. Moreover, the species is gradually encroaching upon the pine and fir.

The sugar pine is scattered, and confined chiefly to ridges. It is of medium quality, the chief defect being rotten tops and hollow butts due to old age.

The incense cedar is of little importance, and is badly infected with pencil rot.

The following plan of cutting was agreed to by the applicant and will be followed throughout the progress of the sale: In yellow-pine stands, on areas where practically all the timber is overmature, everything will be cut except two or three of the best crowned trees on each acre, which will be left to reseed the ground. On areas badly infested with beetles, all the mature trees will be cut, provided there are a sufficient number of young trees to reseed the ground within a few years. In this way immediate seeding will be sacrificed in order to get rid of diseased trees, and so prevent infection of the next stand. In immature stands only suppressed trees will be cut. Where yellow pine and Douglas fir grow in mixture, all badly defective pine will be cut, and if there is not remaining a sufficient number of pine trees to reseed the area, provision will be made for a second crop of Douglas fir. In Douglas-fir and white-fir stands all the white fir will be cut, and five or six of the smaller Douglas-fir trees left on each acre to insure a second crop of that species. All young thrifty sugar pines will be left standing, and of the older ones, seed trees will, wherever possible, be left 300 feet apart. All incense cedar will be cut, except that growing in open pine stands which may be needed for ground cover. Brush will be piled and burned after logging.

On this sale area, as elsewhere on the Forest, it will be seen that the species favored are, first, yellow pine; second, sugar pine; and third, Douglas fir.

BURNS.

All portions of the Forest show evidence of fire in the past, the original stand on perhaps 30 per cent of the present area having been destroyed at one time or another. With the exception of large burns in the Bald Mountain, Bessie Rock, Huckleberry Mountain, and Cat Hill regions, the Cascade portion does not show as much damage as the Siskiyous. The greater frequency of fires in the latter region was due chiefly to the number of prospectors who at one time traveled over the mountains, leaving unextinguished camp fires behind them.

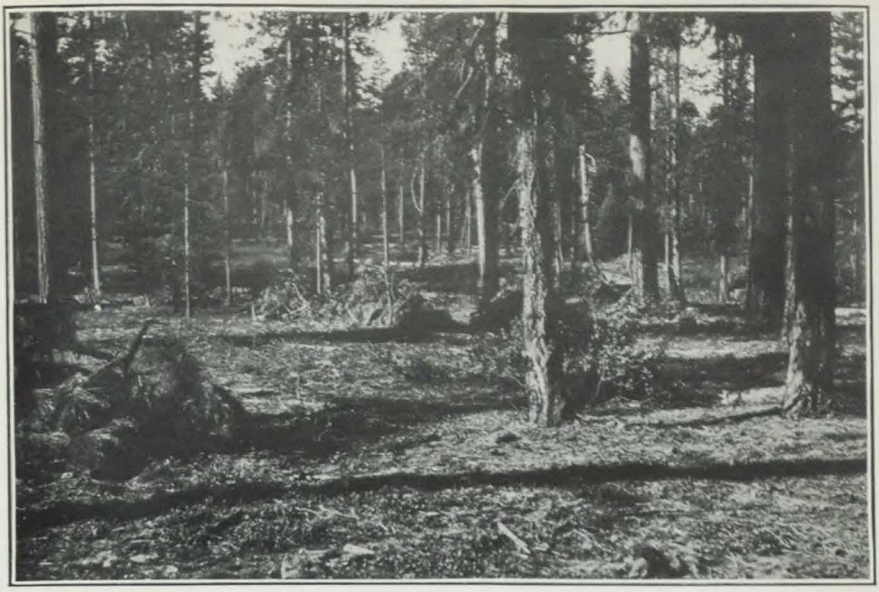


FIG. 1.—A CUT-OVER TIMBER SALE AREA ON THE YELLOW PINE TYPE, SHOWING BRUSH PILED AND STAND LEFT AFTER LOGGING.

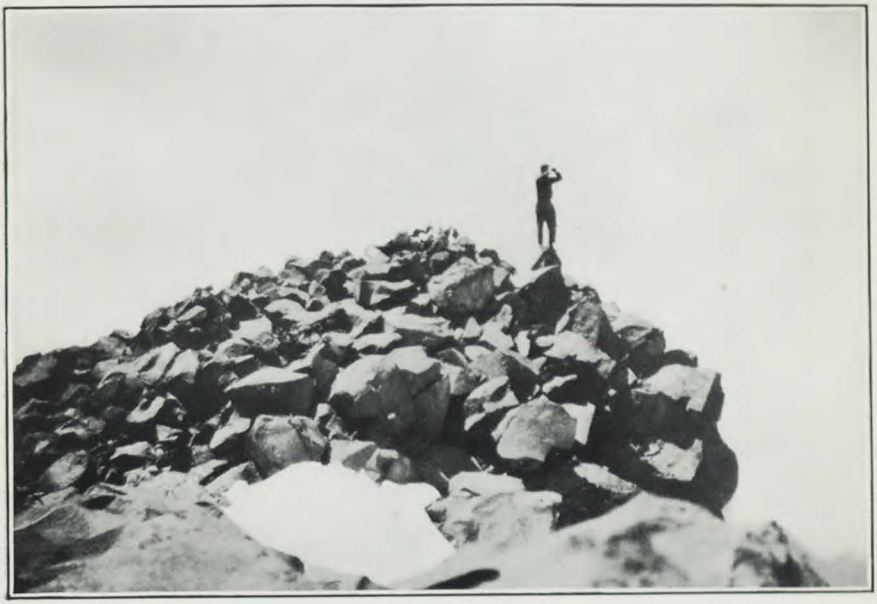


FIG. 2.—LOOKOUT STATION, SUMMIT OF MOUNT MCLAUGHLIN, CRATER NATIONAL FOREST, DURING THE FIRE SEASON, 1910.

Evidence of past fires is shown in places by charred stubs, burned butts, and cat faces; in others by the encroachment of lodgepole pine on areas formerly occupied by yellow pine and Douglas fir; while in still others, where the original forest was entirely destroyed, by a cover of brush and vellum-leaved ceanothus. While yellow pine and Douglas fir will probably in the course of time force themselves through and above the brush, and even reestablish themselves again on the lodgepole areas, the process will of necessity be exceedingly slow, and complete reforestation by natural means will take many years to accomplish. Burned areas will therefore be artificially restocked with either sugar pine, yellow pine, or Douglas fir, according to altitude and site, as fast as practicable. Experimental plantations have been established at Pelican and Thompson's Creek ranger stations, to determine the possibility of raising hardwood forests in the region included within the Crater Forest. The plantations were started in May, 1909, and the species planted were shagbark hickory, pignut hickory, and black walnut. So far, all the species are doing well.

THE FIRES OF 1910.

The summer of 1910, an unusually dry one, witnessed an unprecedented number of fires upon the Crater Forest. Thirty-seven severe fires gained a start at different times during the dry season and burned over areas ranging from 25 to 32,768 acres, and totaling 60,891 acres, before they were subdued. Some of them were confined to brush areas, but all told they killed on the Forest 250,000,000 feet b. m. of merchantable timber. In addition, 75 small fires, ranging from abandoned camp fires to areas of 5 acres, were extinguished by rangers in the regular course of their patrol work.

A large part, perhaps a majority, of all the fires are believed to have originated from carelessness on the part of hunters and campers. Unfortunately, the open season for game in southern Oregon begins on August 1 and brings many persons into the mountains at a time when the fire danger is greatest. If the open season had begun on September 15, instead of on the 1st of August, it is safe to say that the number of fires which originated on the Forest would have been less by from 30 to 40 per cent. Other fires originated outside the Forest and swept across the boundary before a sufficient force could be gathered to check them, while still others, and not an inconsiderable number, were the result of malicious intent. The areas burned in and near the Forest during the summer of 1910 are shown upon the accompanying map.

The starting of so many fires, often several at practically the same time in widely separated places, made it impossible for the small force of rangers and guards to cope with the situation successfully. At the beginning of the danger season the force upon the Forest

available for patrol work numbered 17 men. Each one of these had, on an average, 66,000 acres of rough, mountainous country to cover, and as a result, many fires had gained great headway before being discovered. Once discovered, moreover, lack of telephone lines often delayed a report to the headquarters office, while, after a report was received, lack of roads and trails made it difficult and often impossible to get an adequate fire-fighting force, together with the necessary tools and supplies, promptly to the scene of the conflagration. During the summer 1,000 men were employed in fighting the fires on the Crater Forest, but even this number proved inadequate. Five companies of United States troops were therefore ordered to the Forest by the War Department and rendered efficient service in subduing the flames. In all, the cost to the Forest Service for fire fighting on the Crater Forest during 1910 amounted to $40,000.

One thousand acres of the burned area were sowed during the fall of 1910. Owing to the complete failure of the local seed crop, it was impossible to use native species in the work. Scotch pine was planted on the yellow-pine type, and Norway spruce and European larch in mixture on the Douglas-fir type. The cost was approximately $3 per acre.

GRAZING.

During the fiscal year 1911, 4,133 head of cattle and 9,525 head of sheep grazed upon the Forest. The grazing land is confined chiefly to the higher altitudes, on mountain meadows and in open timber. The Forest offers practically nothing but summer range, only a few year-long permits being issued, and those all on the western portion. Both sheep and cattle are excluded from the watershed from which the city of Ashland gets its supply.

The first permits for grazing on the Forest were issued in 1901. Prior to that time the range had been controlled by a few large stock owners, not local residents, whose policy it was to crowd the small local owner off the land. This was not difficult to do, and, so far as the local owner was concerned, it was exceedingly problematical at the opening of any grazing season whether he would be able to find range for his stock. With the creation of the Forest, however, was inaugurated the present system of range allotment, by which the bona fide settler living in or near the Forest, and who is dependent for his living largely upon the small band of stock he owns, has first right to the range and is allotted a certain portion for his exclusive use. Under this system the range has undergone a distinct improvement, and to-day is capable of supporting many more head of stock than at the time of the Forest's creation. During the last few years the quality of stock has also shown steady improvement. The greater number of cattle now grazed upon the Forest are white-faced Herefords, which are found to do better here than any other breed.

MINING.

While much prospecting for copper and gold has been done in the Cascade portion of the Forest, the grade of ore so far discovered has usually been too low to justify the installation of expensive machinery. The only operations now in progress are at what is known as the Elk Creek mines (T. 31 S., R. 1 E.), where some $15,000 has been expended in development and a small stamp mill erected. Quartz mining on this portion of the Forest, however, remains practically undeveloped, awaiting capital. With better railroad facilities the necessary money will undoubtedly become available, and in the aid of future development of quartz mining here the timber on the Forest will be a most important factor.

The Siskiyou portion, on the other hand, is a typical mining country. In the sixties and seventies much placer mining was done, and even to-day there is good placer mining along Sterling Creek and Little Applegate River, but as a rule it has given way to quartz mining. Just south of this portion of the Forest, in California, are the famous Blue Ledge copper mines, which, though yielding only a moderate amount of ore at present, promise to become among the richest copper mines in the West.

SETTLEMENT.

The region within the Forest is not one to attract settlement, since the climate precludes the possibility of raising any crop but hay. On the east slope the winters are long, snow is deep, and Klamath Lake always freezes over, while on that portion of the west slope within the Forest conditions are but little different. Everywhere on the Forest late and early frosts are frequent and severe. Thirty-five homestead claims, aggregating 3,325 acres, have been entered under the act of June 11, 1906, chiefly in the lower valleys of the Siskiyou Mountains, where the climate is milder than elsewhere. The few actual settlers on the Forest are engaged mainly in raising stock, and maintain road houses along the different routes of travel over the mountains, where travelers are accommodated and pasture and hay furnished their horses.

CRATER LAKE AND THE MINERAL SPRINGS.

An ever-increasing number of tourists are attracted each year to Crater Lake, the deepest body of fresh water in North America, and, because of its deep blue color and the grandeur of the encircling cliffs, one of the most beautiful spots on the continent. While not within the Forest boundaries, it is surrounded by them on three sides, and is best reached by a picturesque mountain road which passes much of its distance through the Forest, and on which is the Natural Bridge of Rogue River.

Three important mineral springs are situated within the Forest, known as Dead Indian, McAllister, and Grizzly Soda Springs. The Dead Indian Spring is situated at the junction of the South Fork of Little Butte and Dead Indian Creek, and is reached by a fairly good mountain road from Medford, a distance of 25 miles. It is visited by a large number of people.

The McAllister Springs, 30 miles east of Medford, are perhaps the most accessible, and adequate accommodations are afforded for a large number of campers. Big game is still found in the vicinity, and the fishing is fairly good.

The Grizzly Springs lie 25 miles east of Ashland, and are reached by the Ashland-Fort Klamath wagon road. Though much like the two other springs, they are less widely known.

PERMANENT IMPROVEMENTS.

At present the Forest is poorly equipped with telephone lines, trails, and roads. During the fires of 1910 it was necessary, on account of lack of telephone communication, to use mounted messengers to bring news and carry orders to and from headquarters, a slow and uncertain procedure.

Both the Prospect country and the east side of the Forest, with the exception of Klamath Lake and Pelican Bay regions, have few trails, and most of those which exist were made long ago by hunters and trappers, and are very poor. An example of the importance of trails in fighting fires was given in the case of the South Fork fire (see map) in the summer of 1910. Over a trail which runs from Prospect to Four Mile Lake it was possible to bring a large body of troops, together with 24 loaded pack mules, to the scene of the fire in reasonably quick time. Had there been no trail it would have been next to impossible to have gotten the troops there before the fire, an unusually severe one, had spread over an enormous area. The question of transporting supplies also would have been one exceedingly difficult, if not impossible, to meet. The cost of building trails on the Crater Forest varies from $62 to $100 per mile.

Only two roads cross the Cascade Range, one via Prospect to Crater Lake, the other via Ashland to the Pelican Bay country and Crater Lake. Both were originally trails, which have simply been worn into roads. Both the Forest Service, and private individuals through subscription, have done considerable work in improving the road via Prospect. Though the greatest need on the Forest at present is for telephone lines and trails, at least one good road of even grade over the mountains will become almost a necessity in the near future.

Up to the present, 27 miles of roads, 175 miles of trails, and 130 miles of telephone lines have been constructed on the Forest.

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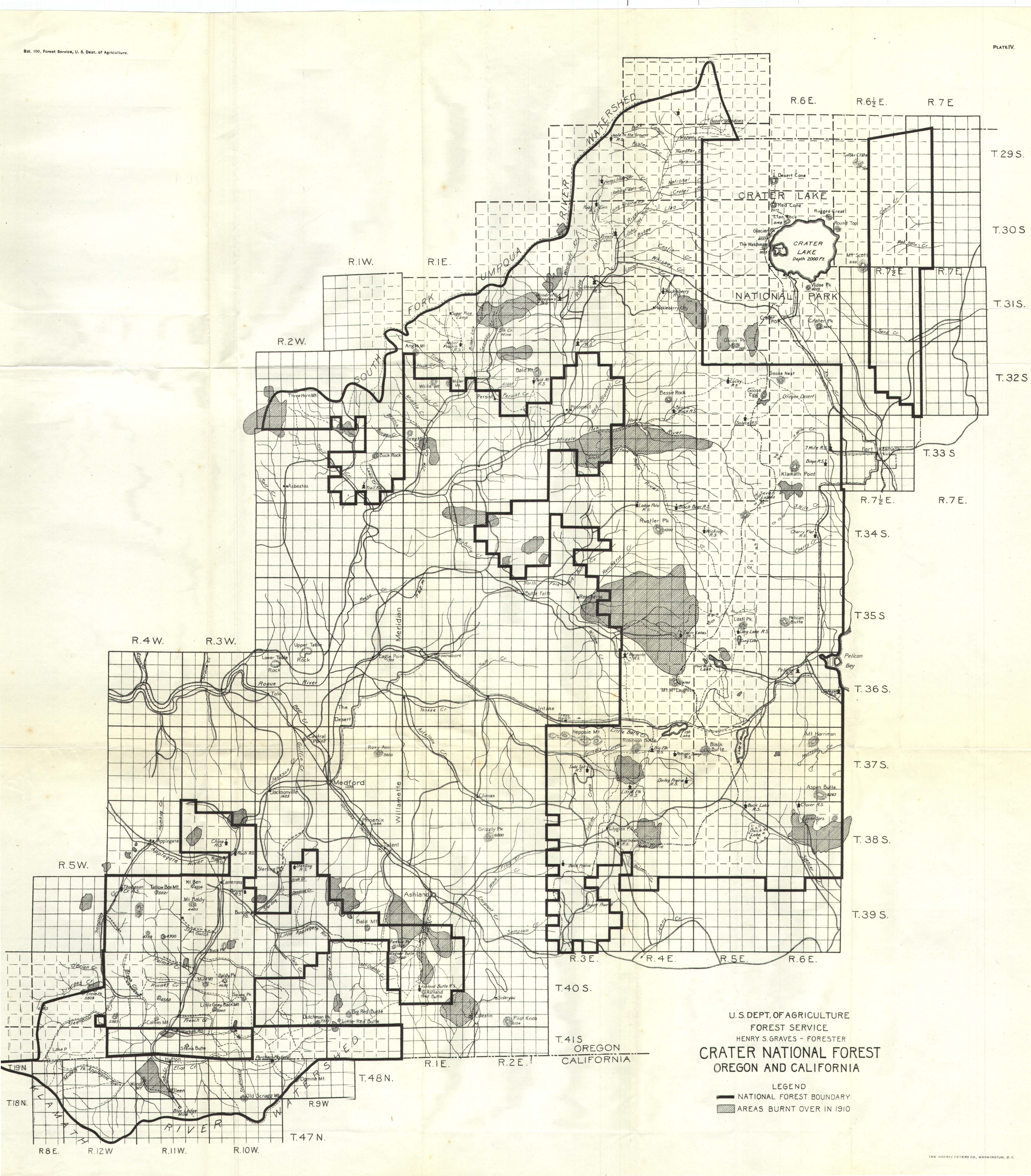

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FOREST SERVICE
HENRY S. GRAVES - FORESTER

CRATER NATIONAL FOREST
OREGON AND CALIFORNIA

LEGEND
- NATIONAL FOREST BOUNDARY
- AREAS BURNT OVER IN 1910

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